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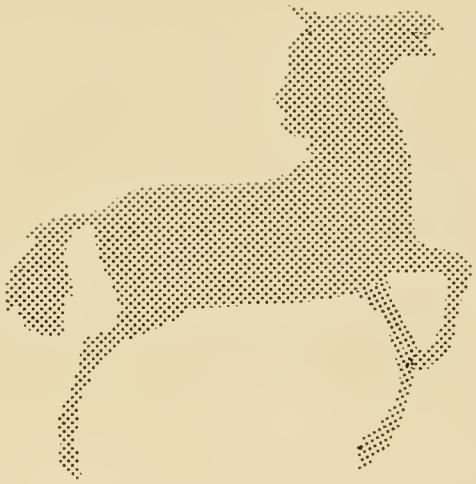
Volume III — NO. 3 MONTANA FISH AND GAME DEPARTMENT MARCH, 1968

WILD HORSES



From time to time, inquires come in to the Fish and Game Department asking the whereabouts of wild horses in Montana and of laws regulating their capture. Until the last year or two, the answers to such questions seemed simple and forward enough — "There are no wild horses in Montana. There may be some horses running loose, but they are simply wandering offsprings of domestic stock, or feral animals. Every animal in the state belongs to an individual or to the state."

Under a new Bureau of Land Management policy, however, the question of whether or not there are indeed wild horses in Montana is one to reconsider. Under the new policy directive, any unbranded and unclaimed horses or burros utilizing lands administered by the bureau are considered wild. Although these animals are not wild in the same sense as deer and elk, from a practical view they are wild in the eyes of the general public. From this standpoint, forage reservations on public lands can be made for horses if there is a management plan, and if it is in the public interest to retain a feral herd of horses in the area. Forage reservations are presently set aside only for the traditional wild big game species. The directive may conceivably conflict with some state laws; although, it does state that management plans and cooperative agreements shall be consistent with state statutes.

The little Indian pony of the old west was a far cry from the type of horse deemed by some to be wild in Montana's Pryor Mountains. The following excerpt from a Bureau of Land Management publication nicely outlines the development of "mustangs" as follows. "He climber off a brigantine at Veracruz, Mexico, about 1520 with the famous conquistador, and he's been in America ever since. When Cortez and his Spanish soldiers set out to conquer Mexico, they were mounted on clean-limbed, high-headed, hot-bloods from Andalusia and Navarro, bred and up-graded from the Arabian-Barbs of Africa. These horses represented the finest horse-blood from Arabia, Europe and the Mongol horses of Genghis Khan."

"But during the next hundred years, or so, many of these finely-bred horses strayed from their owners and collected in wild bands in the deserts of Mexico. As the bands gradually spread northward, some of the horses became inbred and runty. By the time he was mounted by the American Indians, the mustang was changed radically from his hot-blooded ancestors. He was a multicolored, short-coupled, grass-bellied animal that was tougher than whang leather. He ate everything from grass to grapevines, and could go farther in a shorter time on less feed and water than any means of locomotion then known to man. At the end of the day he still had enough fire to break your leg or bite through a pair of bullhide chaparajos." . . . "The original mustang blood has long since been mingled with domestic horses gone wild; mares and colts left to run loose on mountain ranges were stolen by wild stallions and added to their harems. This mixture constitutes the wild horses, or 'mustangs' we know today."

The larger groups of "wild" horses today are found in Utah, Nevada, California, Oregon, New Mexico, and Wyoming. The Bureau of Land Management estimates that there are some 17,000 wild horses and 8,000 burros roaming the public domain, primarily in ten western states. In Montana, the "wild" horses wander over B.L.M. lands in the Pryor Mountains south of Billings. These horses reportedly do not resemble the short-limbed, pot-bellied, jug-headed description given the old west "cayuse," or "mustang." Reportedly, also, several of their members do bear brands.

In some of the western states, wild horses and burros have gained a certain amount of infamy. Not only do they compete with domestic stock and game for forage, but they have been blamed for driving domestic stock away from remote water holes and trampling small spring areas into unusable conditions. On the other hand, they have been befriended. Among groups formed to protect the animals are "The International Society for the Protection of Mustangs and Burro," and "The National Mustang Association," In 1962, the Department of Interior, cooperatively with the Air Force and the Nevada Fish and Game Commission, established a 435,000 acre reserve for wild horses in the Nevada desert. In 1965, a wild horse protection and management area was established in the Cedar Mountain area in Tooele County, Utah.

Because of ownership and other questions, little can be said about the future of a wild horse herd in Montana. B.L.M. Director Boyd Rasmussen has stated: "While we recognize many problems associated with wild horses—competition for forage, question as to ownership, and interpretation of the legal status of unbranded and unclaimed horses —we feel that the public has amply demonstrated its concern for these animals." In accordance with the new policy directive, B.L.M. offices have been instructed to:

1. Where it is determined that the esthetic value of wild horses or burros on Bureau-administered land is a public asset, a planned management program shall be initiated. Management plans will be developed to accommodate a reasonable number of animals.

2. In situations where wild horses or burros compete with livestock and wildlife for limited forage and water, B.L.M. will work with interested groups, livestock operators and state wildlife agencies to assure good management of all.

3. Where forage for wild horses or burros has been reserved, bureau field officials will establish cooperative management agreements with state and local authorities and with other interested groups. The cooperative agreements will be consistent with federal and state statutes.

4. B.L.M. recognizes that wild horses and burros may become too plentiful for the protection and conservation of the public lands. Where control is required, B.L.M. will work with state and local authorities in gathering excess animals to reduce the herd to manageable numbers.

Telemetry-Sagebrush and Wildlife

By Duane B. Pyrah

When an area is sprayed to rid it of sagebrush, increased grass production is but one of many results. The Bureau of Land Management and the Montana Fish and Game Department are studying total results of spraying as it affects local plants and animals.

Of late years as our culture has become oriented toward electronic gadgets, several technical words have crept into rather common usage. One such word "telemetry" has grown in use with our space program. In its broadest sense, telemetry is the recording of information which is broadcast from a distant point. The broadcast doesn't have to be from space however. In fact, it's become an important tool of wildlife workers here in Montana.

Tiny transmitters no larger than your little finger are being used to show the location of antelope and sage grouse in the "Yellow Water Triangle" between Grassrange and Winnett in central Montana. It's part of cooperative research by the State Fish and Game Department and the Bureau of Land Management to determine the effects of sagebrush removal upon wildlife in the area. The device carried by antelope consists of an antenna and a small box with

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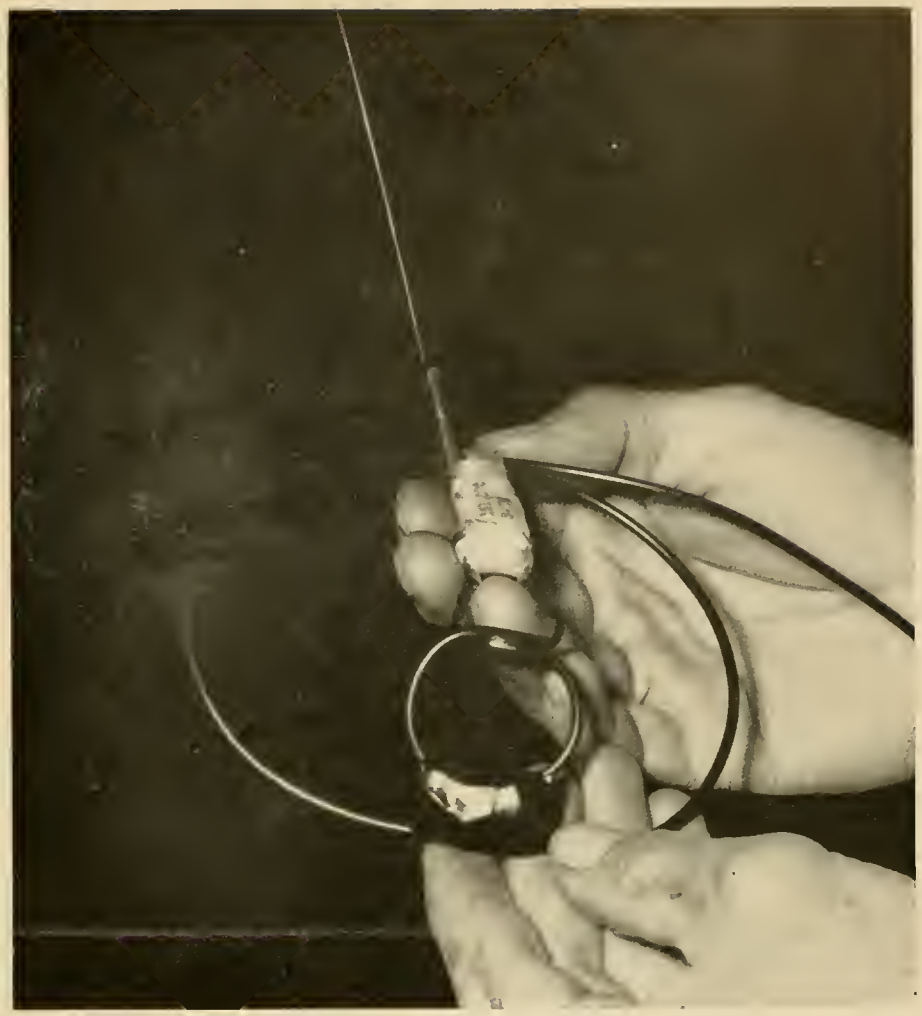
transmitter and batteries attached to a leather collar. Two mercury batteries (the size of flashlight batteries) provide power to transmit a steady pulsating signal for approximately a year. The transmitter signals can be picked up a distance of four to seven miles.

Transmitters for antelope and sage grouse are the same except a smaller mercury battery (penlight size) is used on sage grouse and the transmitter is attached to sage grouse with plastic tubing. The grouse transmitter has a transmitting range of one to two miles and a life of three to four months.

Radio telemetry has made it much easier to locate marked animals. With ideal conditions it is possible to cover over 8,000 acres from one point and know if there is an instrumented sage grouse in that area. The antelope transmitter is more powerful, and broadcasts its signal over approximately 32,000 acres. To find marked animals over such large areas by conventional means would take a large work force.

Montana's first radio-equipped antelope were released on December 9, 1966. Twenty antelope were trapped near Winnett and three were released with transmitters. The others were released with neck bands which could be identified over half a mile away. During the following months of December, January, February and March the importance of radio telemetry for locating antelope herds was realized. Frequently a radio signal was heard several times before the antelope were visible with binoculars or spotting scopes. Despite the open country they inhabit, antelope can be hard to spot in a background of sagebrush and snow.



This tiny transmitter is one type used on birds. The harness of plastic tubing does not hamper flight or other activities of radioed birds.

Sage grouse are, as the name implies, greatly dependent on sagebrush. This one in the study area near Winnett is marked with a numbered banner.

In order to locate the radioed animals, the field worker stops at an advantageous spot, tunes in a receiver and swings a directional radio antenna in a wide arc. Signals picked up are loudest when the antenna is pointed directly at the transmitter. Additional listening on high ridges or buttes allows location of the instrumented animal by a method known as triangulation. Observers then move to a location where the animals can be viewed with a spotting scope for neck markers and classification as to age and sex. Other information is taken on feeding and types of vegetation used.

Results of the experimental radio and neck-marking in the first year were good. In December, 1967, four antelope were fitted with transmitter collars and 31 more were fitted with neck markers. Four months of experimental work with the radios has revealed many locations of radio-marked antelope and

Bob Brown, Research Biologist, listens for radioed grouse. An experienced operator can listen in on transmitting animals and by sound alone determine what the animals are doing.

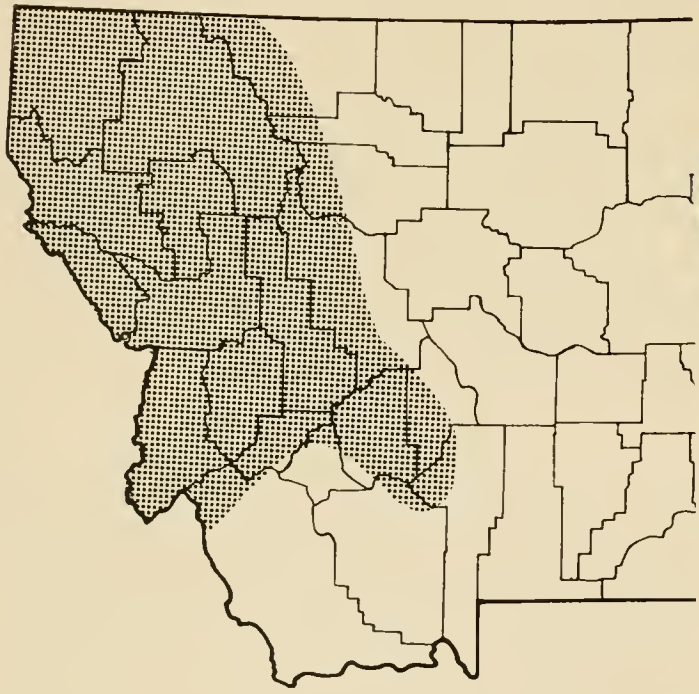
increased greatly the observations of other antelope which are neck-banded.

Studies of marked antelope were designed to show the home ranges and habitat used by these herds of antelope during each season of the year. Most antelope in the Yellow Water Triangle appear to be non-migratory. Their seasonal home ranges are generally small and only short distances separate preferred summer ranges from critical winter environs. These studies show that average herd home ranges are about five square miles. Yearlings use larger areas. Does and fawns use areas of a small size. Studies indicate that the sagebrush-grassland vegetation type is the most important winter habitat for prong-horn and sagebrush is the most important single food item for antelope during winter.

Sage grouse telemetry studies were conducted during winter months of 1966 and 1967. A study of neck-marked sage grouse has been going on for several years but the radio improved the ability to find individual flocks consistently and speeded up the process of delineating important winter areas. As one has to be very close to see sage grouse, radio telemetry has been even more important for locating them than locating antelope during winter. The number of neck-marked sage grouse relocated in the wild has more than doubled since radio-marked grouse have been present in the winter flocks.

These studies indicate that in winter, sage grouse prefer the flatter land forms. The thicker sagebrush areas provide preferred food and cover during winter seasons, especially when snow covers the ground. The combination of flat topography and dense sage makes these areas prime targets for sagebrush control.

Additional studies are planned to determine the consequences after sagebrush is removed from key portions of sage grouse and antelope habitats. Radio telemetry will undoubtedly continue to be an important tool in studying Montana wildlife habitat requirements.



This is a male specimen of the rare and unique tailed frog. Shaded portion of the map shows the range of the tailed frog in Montana.

"FROG WITH A TAIL"

by Jeffery H. Black & Judith N. Black
(University of Oklahoma)

Did you know that Montana is one of the few places in the world where there are frogs with tails? The tailed frog **(Ascaphus truei)** is the most primitive species of American frogs. It is a small frog which inhabits cold, swift, mountain streams and is one of the most water-dependent frogs in this country. It is found only in the northwestern United States and southwestern Canada. The only other relative of the tailed frog is a genus of mountain-stream-inhabiting frogs in New Zealand.

The tailed frog gets its name from the males of the species which have a tail-like extension of the cloaca that is used in mating. This is not a real "tail," even though it certainly looks like one. Two tiny tail-wagging muscles with the awesome names of pyriformis and caudalipuboischiotibiales show the descent of the tailed frog from its tailed ancestors. This "tail" is an organ for copulation and is necessary because of the habitat of the tailed frog. External fertilization would make the species vulnerable to extinction in the fast moving water where it makes its home. With external fertilization in the swift water, the sperm, as soon as it is shed, would be carried downstream before it could fertilize all the eggs of the female. Thus, nature has provided the male tailed frog with a tail so that he may fertilize the eggs of the female internally and the species is able to reproduce successfully. This is the only species of frog in which fertilization of the eggs is internal.

The tailed frog is one of the few species of frogs in the world in which the male lacks a voice with which to call its mate. Distinctions additional to the lack of voice and the mountain-stream habitat is the fact that the ear of the tailed frog is not like that of most frogs. The tailed frog lacks not only a tympanum (ear drum) but also the Eustacian tube and a stapes. Unlike all other frogs, it has short ribs attached to some of the vertebrae. The vertebrae of the tailed frogs are of the type found in the very early amphibians and reptiles. Its lungs are very much reduced. Its tongue cannot be stuck out. Most amphibians have a horizontal pupil in the eye, but the tailed frogs always have a vertical pupil.

The tailed frog in Montana is restricted to suitable streams within the western third of the state. Its range includes the Rocky Mountain front, many mountain ranges and intermontane valleys or basins. It is found only in cold, swift, mountain streams which usually have numerous waterfalls. Deep snow is usually present during the winter and the streams remain cold with stable flows throughout the year.

Adults of the tailed frog are only about two inches long and are usually olive, brown, or gray on the back and lighter underneath. Adults have a warty appearance. The only markings on some adults consist of a black band extending from the shoulder, across the eye, over the nostril, and ending on the edge of the upper jaw. On some adults, a light patch extends across the head at the level of the front half of the eyes. A light spot may angle from behind each eye toward the middle of the back. The fingers are free of webbing while the toes are slightly webbed with the outermost hind toe broader than the rest.

Underside of a male tailed frog. Note the "tail" which is really an extension of the cloaca and used in mating.

A female tailed frog. Note the external characteristics and how well the frog blends with surrounding rocks.

The tailed frog is usually active only during the night. During the day, throughout most of the year, adults are found under rocks in the stream beds, under overhanging stream banks, or under rocks in small springs that enter streams. Adults seldom leave the water except on extremely rainy days. Adults and tadpoles can survive only a short time out of water.

During the winter when water temperatures may be below freezing, the tailed frog buries itself in the sand under large hard-to-move rocks where it remains until spring. In the spring when the streams are swollen from the spring runoff, the tailed frog is found in quiet side pockets of streams.

Males develop nuptail characteristics during the summer such as horny black outgrowths on the inner side of the first finger, palms of the front feet, forearms and even on the chest. The "tail" also becomes swollen and appears engorged with blood during the actual mating which takes place in the early fall.

Egg laying does not occur concurrently with mating, but the sperm is carried by the female through the winter to the egg laying season which occurs during the following year during June and July in Montana. As the eggs are laid, they are fertilized by sperm that has been stored in the uterus. Even though the tailed frog is only two inches long, it lays one of the largest eggs of all our frogs. Each egg is roughly one-fourth inch in diameter. The eggs are unpigmented and take approximately one month to hatch.

Tadpoles or larvae of the tailed frog are highly modified for life in cold swift streams. The tadpoles can secure enough oxygen in swift water to get along without external gills and these never develop. Lungs which aid in regulating its vertical position in the water are reduced. The mouth is modified into a sucker-like organ which enables the tadpoles to attach to rocks and move upstream in humping movements against the current. Tadpoles of the tailed frog are easily recognized by their sucker-like mouths.

Rows of minute-black teeth are found in the sucker like mouth. There are usually three tooth rows in the upper part of the mouth and around nine tooth rows in the lower part of the mouth. The number of teeth increase with the age of the tadpole. There is a variation of tooth form in the tadpoles. Some teeth appear to be used for scraping food from the rocks, others for grinding food, and others are comb-like and may be used for assistance in attachment to rocks and movement in the swift streams.

In Montana, three age classes of tadpoles may be found at any one time of the year. Tadpoles in the first year are slim and lack appendages. During the second year, tadpoles show early development of the

hind legs and have heavy bodies. Tadpoles in the third year have well-developed hind legs and the front legs are present. The tadpole transforms during the third year into a juvenile.

The tailed frog, **Ascaphus truei,** with its primitive status, specialized life history and peculiar habitat is a unique and interesting animal in the living world.

Tadpoles of the tailed frog. Tadpole 1 is in the two-year class. This is a belly view and the developing hind legs are discernible. Visible also are rows of teeth in the open mouth. Tadpoles 2 and 3 are the one-year size class. They have much thinner bodies and development of legs is not yet evident.

SUN RIVER GAME RANGE

By Bert Goodman

The Sun River Game Range near Augusta originated during 1948 when the Montana Fish and Game Commission gained control, by purchase and lease, of 20,000 acres of foothill lands. The purpose was to provide winter forage for the Sun River elk herd which had previously been forced to feed on private lands when deep winter snows drove them from the mountains. The purpose was not to increase the number of wintering elk, as many believed, but to reduce, or if possible eliminate elk depredation to privately owned ranges and hay supplies. Plans were to accomplish this by providing as much natural forage as possible on the game range and by encouraging elk to use the range. The amount of available winter forage on the game range and on certain Forest Service areas sets the population limits for this elk herd.

Immediately the department set about to improve the lands and to increase and protect forage production. Property boundary fences were constructed to prevent the trespass of domestic stock onto the range and to discourage elk from going onto adjacent private lands. Fire lanes were constructed to aid in the suppression of fires and to serve as access routes about the property. Regular patrols were begun for the detection of fire and for control of trespass stock. A range inventory of lands and forage plants was made. Grass and browse exclosures, transects and plots were established to enable big game biologists to keep track of range trends and conditions.

In the past, extensive experiments with salt to influence winter range use patterns by elk have met with little or no success. Experiments are currently under way to determine how application of commercial fertilizers may be used to manipulate elk use of certain range areas and thus get a better distribution of range use. Herding operations are carried out on adjoining private lands to encourage elk to move onto the game range.

After initial development and management phases were established, it became apparent that the range was providing many side benefits to sportsmen in addition to the wintering of the Sun River elk herd. The additional benefits were in the form of fishing, bird hunting, waterfowl hunting, sightseeing, and photography. The busiest period of public use on the game range starts with the warm days of spring and runs through the month of December. One center of activity is Swaizzee Lake, a small but very productive pond located alongside the main headquarters road and kept stocked with catchable sized rainbow trout. Because of the popularity of this pond among fishermen, especially elderly fishermen and family groups with small children, other public use facilities have been added. These include a drinking water supply, sanitation facilities, tables and fireplaces. A sharptailed grouse dancing ground located in the area brings out some photographers and bird watchers during the first part of April. With the opening of the general fishing season, fishermen start working the eight miles of streams on the game range which are populated with brook trout and offer good stream fishing throughout the open season.

The popularity of the range as a site for high school science and agriculture class field trips has developed during the past several years. Teachers of several high schools make annual field trips to the game range with their classes in order to study and identify native forage plants and to make plant collections. They also observe the animals on the range during the spring and show their students the range work being done by the department. Two Glacier district range judging contests have been held on the game range during the past four years and several of the judging teams make additional trips to the area to identify and collect specimens. Organized groups of youngsters sponsored by schools, churches, scout troops and 4-H clubs participate in "show-me" trips conducted by the department on the

The large herd of elk pictured here found ample winter food on the Sun River Game range and had no need to bother private landowners.

game range. Organized range tours for adult groups are conducted by the Fish and Game Department in cooperation with other state and federal agencies.

During the winter months, to avoid disturbance of the wintering elk herds, it is necessary to control public access onto the area. However, show-me trips for organized groups are conducted about the range so that the elk may be observed and photographed and the department's management practices explained. When organized groups have not made arrangements for trips and there is no conflict with necessary work schedules, individual visitors and private groups are conducted about the range by Fish and Game Department employees on weekends.

During the fall bird hunters find good to excellent grouse hunting in the area. The range is located at about the upper limits of the sharp-tail grouse habitat, but with the increase of cover due to proper management of the forage supply a healthy and huntable population of these birds is found on the lower half of the game range. The first one to two weeks of the mountain grouse season provides hunters with good blue and ruffed grouse hunting. Blue grouse hunting is at its best during the first part of the season before the birds move into the transitional zone on their way to the high ridges where they spend the late fall and winter months. Again, good range management practices have paid off by providing good cover for the female blue grouse and their broods of young. There are many broods of ducks raised on the numerous ponds and potholes found on the game range and these birds offer good waterfowl hunting. There is fair hunting of snow and Canada geese after these species start to migrate through the area and before the freezeup of the lakes and ponds.

For the first seven years the game range existed, it was closed to the hunting of all big game. It was found that in spite of efforts by herding to discourage a herd of elk, they established themselves year-around on the game range. These animals had a tendency to stray off the game range onto adjacent alfalfa fields.

It was felt that in order to keep resident elk under control and to provide more hunting it was adviseable to open the game range to deer and elk hunting in the fall. The range has been opened to hunting each fall, for seasons of varying lengths since 1955 and has provided a great deal of sport hunting to Montanans. It is interesting to note that during the first year the game range was open to hunting there was not a great slaughter of deer and elk as some people feared there would be. As an indicator of the popularity of hunting on the project, the opening day of the 1967 big game season found 51 overnight camps, 138 vehicles and an estimated 300 hunters on the range.

Year-around public use of and interest in the game range has increased greatly since the range was established. It appears that this increase in management of the game range in the interest of wildlife should continue to provide important forage and habitat for the Sun River elk herd and other wildlife in the future.

THERMAL COOLING PONDS

Excerpts from an article in the March 1968 edition of "Sports Fishing Institute Bulletin."

As we have noted previously, the potential for thermal pollution of America's waterways is accelerating especially rapidly with progressive conversion of the steam-electric station (S. E. S.) industry to nuclear fuel design. Several methods for handling the waste heat discharged with turbine cooling waters present themselves.

High discharge temperatures often at the level of 115° F. (up to 143° F. in extreme cases) could "cook" the proteins, deactivate enzymes and stimulate the production of toxic materials within the bodies of fishes. Because of this, fishery scientists recommend that "peak" (temporarily highest) water terperatures for warm water fishes should neither exceed

83° to 96° F. (depending on the section of the country) nor remain at those levels longer than 6 hours in any 24-hour period! For cold water fishes, the equivalent temperatures are from 15 to 41 degrees lower, depending either on the season of the year or the particular situation involved. This approach is obviously unacceptable as a general practice.

Another approach again involves a more or less continuous open-circuit flow-through of cooling water at fossil or nuclear fuel S. E. S. In this case, however, these situations become favorably modified by the incorporation within their open circuit cooling systems of evaporative "cooling towers." The latter are designed to precool the heated cooling water effluent before discharging it back into the source watereways. This is accomplished by trickling the hot water down across a well-vented multi-slatted column (designed something like a venetian blind) to maximize surface effect for accelerated evaporation and associated cooling.

Use of evaporative "cooling towers" generally represents a distinct improvement over the unacceptable practice of doing nothing. Its use, however, does not assure that temperature of the discharge water will necessarily be reduced to that of the intake waters.

Moreover, a considerable loss of economically valuable water would result from intensified evaporative cooling. Some stream systems in Great Britain, where several S. E. S. may be spaced sequentially downstream from one another, typically experience 20 per cent losses out of their total streamflow from evaporation in the "cooling towers."

A variant on the open circuit cooling system incorporates a **cooling pond** instead of a "cooling tower," and cools by surface radiation as well as, in part, by evaporation. This third approach has the advantage of reducing evaporation rates, thereby saving significant amounts of economically-valuable water and reducing the local fogging hazard. It depends for cooling principally on heat radiation from the surface of the pond. Such "ponds" are small artificial reservoirs, especially constructed for the purpose, that may range in surface area from several hundred to more than a thousand acres, and up to thirty or more feet in maximum depth. These are waters that some power companies would like to develop for controlled public recreation, particularly sport fishing to the extent feasible. This, in turn, may necessarily involve the utilization within them of subtropical or tropical species of fish and selected food organisms. In this way, new varieties of recreation may eventually be created on a limtied scale—to the credit of such companies. To merit that credit, however, will require adequate support of thorough biological research. It will also require exercise of maximum control over the selection, release, and containment in the selected waters, of imported exotic species.

Yet a final approach, evidently the best in a great many situations—especially where large numbers of huge nuclear-fuel S. E. S. may be contemplated for utilization of the same water source (as, for example, around the Great Lakes)—is unquestionably the closed circuit cooling system design. This approach, employing forced-air radiant heat-exchangers on much the same principle as a fan-cooled automobile radiator, has the capability of entirely eliminating thermal pollution from the S. E. S. operation. In addition, it can also result in conserving substantial quantities of economically valuable water that would otherwise be lost through consumptive evaporation.

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